WESTCARB Regional Partnership

California: Assessment of Offshore Potential and Screening for Salinity in the Southern Sacramento Basin

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CGS / WESTCARB Update

As a continuation of WESTCARB Phase II, The California Geological Survey (CGS) is currently working on:

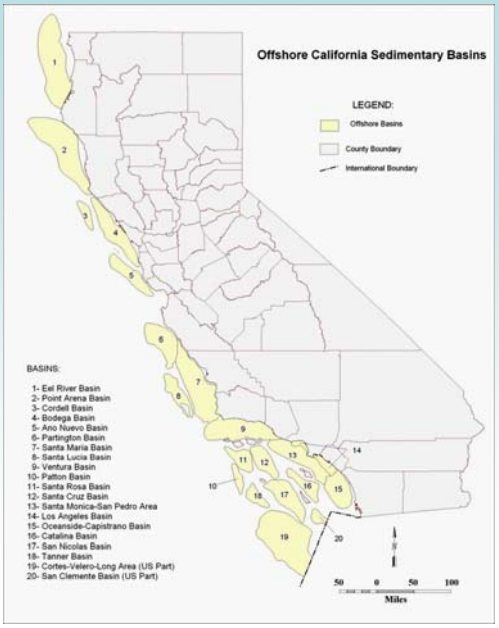
- A preliminary characterization of offshore sequestration potential in California
- An evaluation of salinity in three formations in the southern Sacramento Basin
- An evaluation of the distribution and capacity of hydrocarbon pools in selected fields in the southern Sacramento basin

Offshore Sequestration Potential in California

A preliminary characterization of sequestration potential in basins within State and Federal waters off California

- Twenty offshore basins
- Three basins (Santa Maria, Ventura, and Los Angeles) have known oil or gas fields
- Very limited availability of well log or geophysical data for most basins severely this limits study
- Not possible to map or evaluate saline aquifers in these basins

Offshore Sedimentary Basins in California

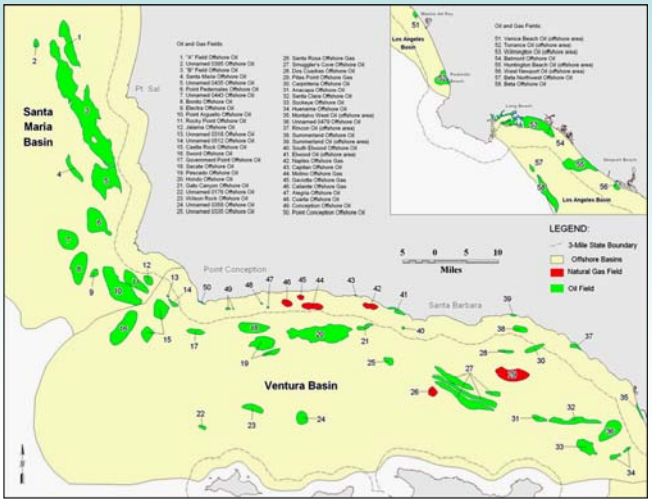


Offshore Sequestration Potential in California

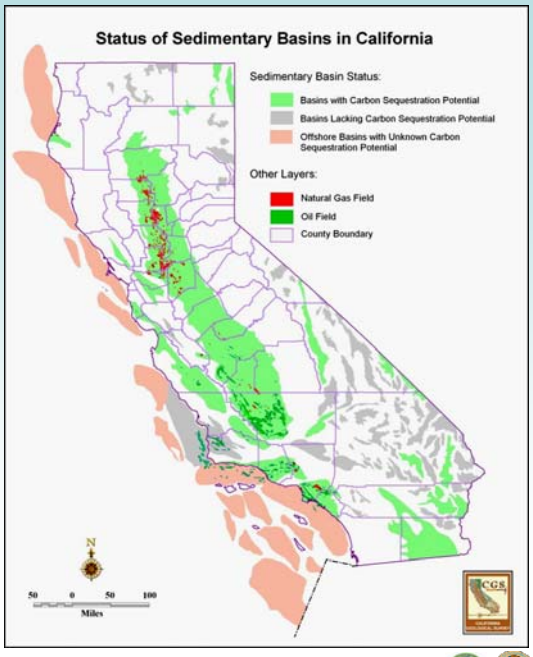
Sequestration potential in offshore oil and gas fields.

- Looked at potential capacity in known developed and undeveloped oil & gas fields
- Excluded fractured reservoirs in Monterey Formation
- Twenty-four producing or depleted fields with about 236 million tons of CO_2 storage capacity.
- Six discovered, but undeveloped, fields with about 3 million tons of CO_2 storage capacity.

Offshore Oil and Gas Fields in the Santa Maria, Ventura, and LA Basins



Sedimentary Basins, Natural Gas and Oil Fields in California



Salinity in the Southern Sacramento Basin

This study builds on our previous Phase II work and looks at salinity in the Mokelumne River, Starkey, and Winters formations.

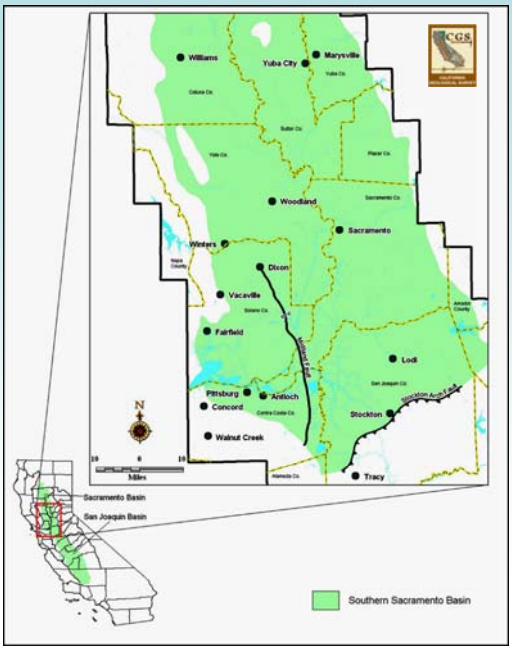
- Little, if any, actual laboratory salinity data is available for these formations.
- Salinities were calculated from spontaneous potential (SP) logs for approximately 4,500 wells in the basin using a simplified “quick look” method.

Salinity in the Southern Sacramento Basin

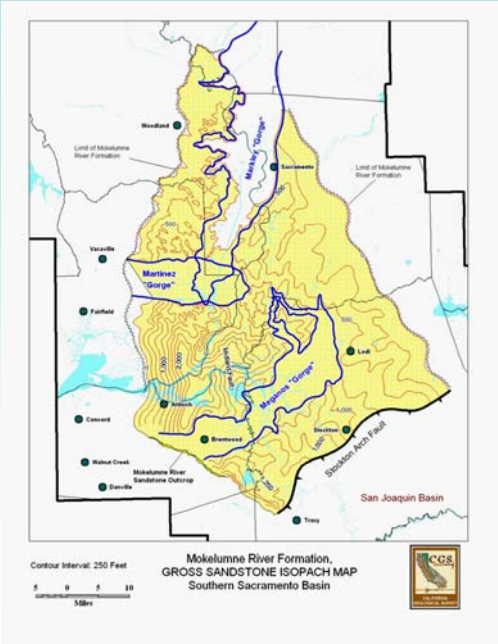
The SP curve response can be suppressed, leading to a lower apparent calculated salinity, by several factors:

- Thin beds (< 20 ft.)
- Low permeability
- Hydrocarbon saturation

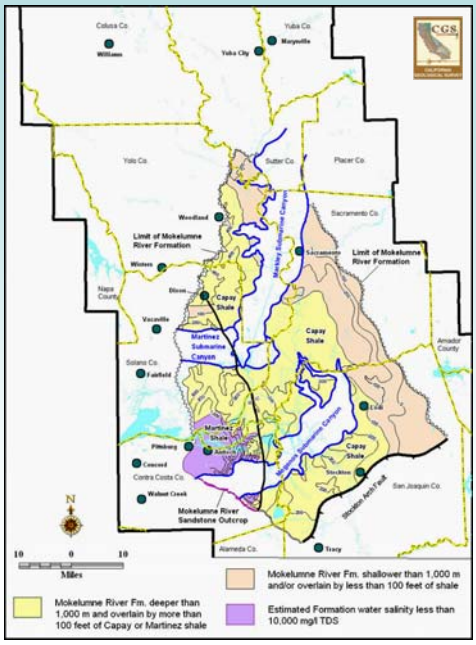
Southern Sacramento Basin Study Area



Mokelumne River Formation Gross Sandstone Isopach Map



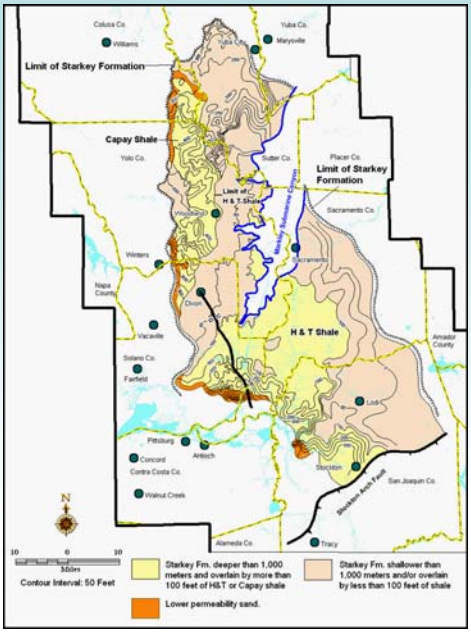
Mokelumne River Formation, Potential Sequestration Areas



Mokelumne River Formation Summary

	Total Area	% of Total Area
Gross sandstone area	1,908 mi^2	100%
Less area of gorges	1,528 mi^2	80%
Deeper than 1,000 meters	1,075 mi^2	56%
With 100+ feet of seal	1,045 mi^2	55%
Salinity > 10,000 mg/l TDS	935 mi^2	49%

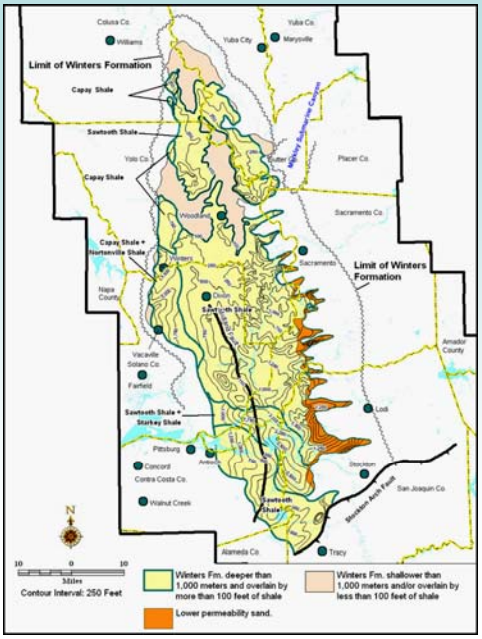
Starkey Formation Potential Sequestration Areas



Starkey Formation Summary

	Total Area	% of Total Area
Gross sandstone area	2,321 mi^2	100%
Less area of gorges	2,214 mi^2	95%
Deeper than 1,000 meters	1,416 mi^2	61%
With 100+ feet of seal	920 mi^2	40%
Salinity > 10,000 mg/l TDS	920 mi^2	40%

Winters Formation Potential Sequestration Areas



Winters Formation Summary

	Total Area	% of Total Area
Gross sandstone area	1,771 mi^2	100%
Less area of gorges	1,771 mi^2	100%
Deeper than 1,000 meters	1,681 mi^2	95%
With 100+ feet of seal	1,524 mi^2	86%
Salinity > 10,000 mg/l TDS	1,524 mi^2	86%

CO_2 Storage Resource Estimates*

Formation	Gigatons CO_2 (0.4%)	Gigatons CO_2 (5.5%)
Mokelumne River	0.4	5.5
Starkey	0.4	5.6
Winters	0.5	6.7
Total	1.3	17.8

*For sands greater than 1,000 meters deep with at least 100 feet of overlying shale and estimated formation water salinity greater than 10,000 mg/l TDS.

Distribution and Capacity of Hydrocarbon Pools In Selected Fields

CGS is currently evaluating the distribution and capacity of pools in the Bunker, Millar, and Conway Ranch gas fields in the southern Sacramento basin.

– Work in Progress

– More next year!

Department of Conservation California Geological Survey

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